DOCUMENT RESUME

ED 048 348 TM 000 422

AUTHOR Judy, Chester J.
TITLE Self-Report Information on High School Curriculum and Achievement in Predicting Performance in Technical Training.
PUB DATE Feb 71
NOTE 9p.; Paper presented at the Annual Meeting of the American Educational Research Association, New York, New York, February 4-7, 1971

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS Academic Performance, Academic Records, *Achievement Rating. Aptitude Tests, Biographical Inventories, *Grades (Scholastic), Information Sources, Military Training, Performance Factors, Post Secondary Education, *Prediction, Predictor Variables, *Self Evaluation, Success Factors, *Technical Education, Vocational Aptitude

ABSTRACT

Predictive utility of autobiographical information given by entering airmen was compared with information gained from aptitude testing. Correlation techniques were used in analyzing data on 13,811 individuals (in 24 analysis groups) who completed training. Generally there was no significant difference in the magnitude of validities for each kind of data, and there was generally no significant difference in the extent to which each could add to the other in joint predictions of school performance. Results suggest the need for expanding the role of the high school record as a source of information for predicting performance in Air Force technical training and the need for a new look at this record as a source of information for identifying persons who can do well in other post-secondary programs. (Author)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

ED048348

# Self-Report Information on High School Curriculum and Achievement in Predicting Performance in Technical Training[1]

Chester J. Judy, Air Force Human Resources Laboratory

Some indication of "success" in secondary training or education has long been recognized as a fairly good predictor of "success" for post-secondary programs. In one review of college admission-selection studies conducted over a ten-year period, Fishman and Pasanella (1960) report a mean correlation of .50 between high-school rank, or high-school grade-point average, and grades obtained in the first year of college. This aspect of the Fishman-Pasanella review covered 263 studies in which correlations of tests with freshman grades averaged .47. They report that the most commonly used measurement device in the 263 studies was the Scholastic Aptitude Test of the College Entrance Examination Board. Next in line was the American Council on Education Psychological Examination for College Freshmen. The Ohio State University Psychological Examination was the third most commonly used test observed in the 263 studies.

One of the most important tests now being widely used in college admission-selection activities in the United States was not mentioned in the 1960 Fishman-Pasanella review. This is, of course, the one available through the American College Testing Program. A unique aspect of this program is that routine use is made of certain data from the high-school record. In particular, examinees are asked to report their last high-school marks in mathematics, natural science, social studies, and English. These marks, in combination with test-performance information, are used to help predict college grade-point average in the four academic areas, and also to predict an overall grade-point average. In the operation of the American College Testing Program, examinees are encouraged to refresh memories

TM 000 422

concerning their last high-school grades in the four courses by checking them at the school administrative office before they present themselves for testing. They are told that their marks, as given by themselves, will later be reported back to the school.

In one early tabulation published by the directors of the American College Testing Program (1961) showing the distribution of validity coefficients of their indexes for predicting first year college grades, covering 66 colleges, a median value of .68 was reported. This compares favorably with a median of .61 reported by Fishman-Pasanella (for 147 studies) for the joint validity of the Scholastic Aptitude Test and average high-school grades, or rank in high-school class. However, no claim has been made concerning any special utility of the self-report marks in the four high-school courses. Rather, it has been pointed out (Lindquist, 1961) that "marks made in just four selected semester unites of high-school are practically as good for predictive purposes as is the grade-point average based on the entire four-year high-school record of the student, or the rank in graduating class based on this overall grade-point average." The statement leaves considerable room for expecting the remaining elements of information obtainable from the high-school record to have some further utility for improving the prediction of college grades. The expectation is further reinforced by some of the results of a recently-completed project financed by the Ford Foundation in which it is seen that a rating given by a high-school counselor, who has the high-school record at hand, serves quite well as a predictor of college success. Nicholson (1970, p. 11) describes the rating "as a variable as good or better than those traditionally used from the cognitive domain." Cognitive measures referred to in this instance included the average of College Board achievement tests and the scholastic aptitude variables SATv and SATm.

In the Air Force, training in the various technical specialties approaches a level of complexity beyond that found in some post-secondary education. Because

the service organizations must devote a considerable portion of their resources to training activities, and because training is a major element in maintaining some degree of efficiency, those background factors relating to preservice education have been found to be increasing in relative importance as military equipment and operations become more complex. With 90 or 95 per cent of the airman force having high-school diplomas, the Air Force is probably in a better position than the other military services to capitalize on preservice educational information in channeling incoming personnel into various training programs. Since 1964, aptitude indexes (which before 1964 had been based solely upon test performance) have included "bonus points" given for the completion of certain high-school courses: physics, chemistry, trigonometry, geometry, or algebra. One of the continuing issues has been a matter on whether or not a greater amount of information from the high-school record will permit a further improvement in the prediction of success in Air Force training. Most of the young men entering the Air Force have rather recently attended or completed high school, so it seems reasonable to expect them to be able to tell, in general terms, something about the grades they received in particular courses (as, for example, "above average," "average," or "below average").

## Method

The sources of information on preservice education for the project under which the presently reported analysis was completed consisted of 1) the responses to a classification interview conducted at the time of basic military training, 2) that part of a biographical inventory pertaining to preservice education, and 3) an experimental questionnaire which named 15 high-school courses and asked for responses on estimated level-of-performance (above average, average, or below average). Other data used in the study were assembled from laboratory tape files containing technical school grades and classification test scores.

The analyses carried out pertained to 13,811 individuals who successfully completed one of 12 Air Force technical school courses. For these analyses, airmen in each specialty were randomly divided into two analysis groups. This made a total of 24 groups. The division made it possible to carry out double cross-validation operations in which each analysis group could be used as a key-development group and also as a hold-out group for verifying the keys developed for "scoring" the educational data.

As a first step in developing a scoring key, point biserial correlations were obtained between final grade in the relevant technical school course and each possible response to the items of educational information, with each possible response (hereafter called a "subitem") arbitrarily scored "1" (for "yes") or "0" (for "no"). Then, if a subitem validity was seen to be positive and significant at the .05 level, a scoring weight of 1.0 was assigned. If the subitem validity was negative and significant at the .05 level, a scoring weight of -1.0 was assigned. All other subitems were given a scoring weight of 0.0. In computing an "education index," each relevant subitem value was multiplied by its scoring weight; these products were summed and a constant added, the constant being a value equal to the number of subitems given negative weights.

## Results and Discussion

The findings of this study are summarized in Table 1. The table lists the specialties considered, gives the number of airmen in each specialty, and, in three columns, shows the relationship (correlation) between final technical-school grade and 1) the relevant aptitude index, 2) the "education index" as described above, and 3) a linear combination of the aptitude index and the "education index."

Table 1 entries show that in 20 of the 24 analysis groups there was no statistically significant difference (at the .05 probability level) in the validities reported for aptitude information and for education information. Three of

the four differences which were significant were in favor of the education indexes. At the .01 probability level, in 23 of the 24 analysis groups, there was no statistically significant difference in the two kinds of validity. In the one group where there was a significant difference, the difference was in favor of the index developed from educational information. Essentially, there is no statistically significant difference in the extent to which each kind of information can add to the other in the joint prediction of technical school performance. What difference there was (at the .001 level of confidence) was in favor of the index derived from background education information: aptitude information failed to make a significant addition in four groups, whereas the educational information failed in only one.

It should be observed that, in most analysis groups, test scores, in the presence of self-reported educational information, did maintain some residual utility for increasing validity coefficients. In median value, an increase of .08 was obtained when test information was added to the educational data. This is about the same as the .07 observed by Fishman-Pasanella in 21 studies in which test scores and high-school rank were used in linear combination to predict college grade-point average. In future selection and classification research in the Air Force more definitive results can be expected with the use of more exact information on the previous educational experience. Presumably it will be possible to determine rather precisely whether or not test information does retain statistical or practical significance. Until the present time, self-report data has constituted the major portion of the available information on the preservice educational record.

In the college situation, where the logistical task of assembling high-school transcript data does not present an additional problem, it seems timely to suggest the need for a more careful analysis of the available data. I believe, here, that an erroneous consensus has been reached with respect to the maximum role of the

secondary-school record. In the usual instance a summary indication in the form of a "high-school grade-point average" or "rank in high-school class" or "high-school percentile rank" is used in college selection-admissions studies. It is not at all unlikely that several kinds of test scores will be found to be redundant in the presence of a better index carefully and separately developed for use at a particular institution. Another way of saying this is to say that some of the currently-used scores derived from external tests probably have no incremental validity for predicting college grades when the high-school record is known.

The implications of a further finding of this nature should be rather important and significant. One that comes immediately to mind relates to the common observation among college admissions officers that persons scoring high on admissions tests, but who do not also have good secondary-school records, usually are somewhat poor risks for post-secondary work (Nicholson, 1970). The expanded use of an "education index" of the kind suggested here should serve to minimize the problem of college admission of an excessive number of bright but relatively immature boys and girls who are not yet ready to take minimum advantage of the opportunity in a higher-level academic environment. Increased accuracy in prediction should permit college admissions officers to identify <u>other</u> categories of potential students for whom alternative training programs should be recommended or devised. Increased accuracy should allow better decisions with respect to the appropriateness of alternative curriculums within the college or university.

## References

American College Testing Program. ACT Pamphlet 164-000-09-05. Iowa City, Iowa: American College Testing Program, October 1961.

Fishman, J. A., & Pasanella, A. K. College admission-selection studies. Review of Educational Research, 1960, 30, 298-310.

Hotelling, H. The selection of variates for use in prediction with some comments on the general problem of nuisance parameters. The Annals of Mathematical Statistics, 1940, 11, 271-283.

Lindquist, E. F. Interpreting the 1961 ACT Research Reports. Iowa City, Iowa: American College Testing Program, 1961, p. 17.

Nicholson, E. Success and admission criteria for potentially successful risks. Providence, Rhode Island: Brown University, March 1970.

## Footnotes

1. Paper prepared for presentation at the Annual Meeting of the American Educational Research Association, New York City, February 1971. The views expressed are those of the author and do not necessarily reflect the views of the United States Air Force or the Department of Defense.

*Table 1.* **Validity of Test-Derived Aptitude Information (A) and Background Education Data (E) for Predicting Technical School Performance (P)**

| Specialty | Group | N | $r_{PA}$ | $r_{PE}$ | $r_{P.AE}$ |
|---|---|---|---|---|---|
| Communications Center Specialist | A1 | 412 | .149 | .277[b] | .284[d] |
| | A2 | 403 | .207 | .293 | .320[d] |
| Aircraft C & W Radar Repairman | B1 | 488 | .404 | .457 | .522[d,e] |
| | B2 | 515 | .294 | .298 | .375[d,e] |
| Ground Radio Repairman | C1 | 490 | .389 | .422 | .494[d,e] |
| | C2 | 478 | .324 | .332 | .409[d,e] |
| Acft & Missile Gd Equip Repairman | D1 | 531 | .326 | .294 | .382[d,e] |
| | D2 | 496 | .351 | .342 | .416[d,e] |
| Mechanic, Acft, Reciprocating Eng | E1 | 388 | .387 | .350 | .481[d,e] |
| | E2 | 448 | .410[a] | .293 | .471[d,e] |
| Mechanic, Acft, 1 or 2 Jet Engines | F1 | 742 | .379 | .336 | .477[d,e] |
| | F2 | 791 | .378 | .308 | .472[d,e] |
| Mechanic, Acft, Over 2 Jet Engines | G1 | 531 | .389 | .349 | .490[d,e] |
| | G2 | 491 | .352 | .318 | .449[d,e] |
| Weapons Mechanic | H1 | 333 | .380 | .360 | .489[d,e] |
| | H2 | 370 | .238 | .334 | .386[d,e] |
| Inventory Management Specialist | I1 | 844 | .317 | .359 | .416[d,e] |
| | I2 | 862 | .311 | .281 | .366[d,e] |
| Administrative Specialist | J1 | 380 | .264 | .242 | .328[d,e] |
| | J2 | 359 | .291 | .213 | .325 [e] |
| Air Policeman | K1 | 1451 | .256 | .216 | .287[d,e] |
| | K2 | 1419 | .191 | .191 | .236[d,e] |
| Medical Service Specialist | L1 | 292 | .266 | .427[c] | .446[d] |
| | L2 | 297 | .241 | .370[b] | .386[d] |

[a]Difference ($r_{PA}$ minus $r_{PE}$) in favor of $r_{PA}$ large enough to be statistically significant at .05 level (Hotelling, 1940).

[b]Difference ($r_{PE}$ minus $r_{PA}$) in favor of $r_{PE}$ large enough to be statistically significant at .05 level.

[c]Difference ($r_{PE}$ minus $r_{PA}$) in favor of $r_{PE}$ large enough to be statistically significant at .01 level.

[d]Hypothesis concerning independent contribution of E accepted at .001 level of confidence.

[e]Hypothesis concerning independent contribution of A accepted at .001 level of confidence.